

Putting Creativity First—Inspiring with Image-based Design Rationale

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Creativity in design can be viewed as an experience in which the consideration of design rationale—particularly artifacts from the design rationale of others—comes with the danger that it will hinder the creative process, inhibiting the natural flow of ideas that are so important to groundbreaking concepts. However, by ignoring the lessons learned by others, a designer risks lacking the knowledge to put forward some truly creative ideas: new ways to make use of existing technology, novel connections among several current technologies, and so forth. The key is to introduce design rationale in appropriate ways so that the first instinct is to consider creative new ways to make use of it—but to maintain the desire to justify, compare, and build toward a quality solution that will appeal to the target audience.

There are three ways in which rationale has been considered fitting into the design process—as a means of organizing the understanding of process and result for both retrospective reflection and forward-looking planning, as a model for an aspect of design thinking for computational methods of designing, and as an on-going resource during design. We primarily focus on rationale as a resource for human designers. In that regard, rationale and creativity are deeply intertwined. In particular, our work seeks to understand how to inspire creativity through appropriate presentation of design rationale—toward the encouragement of highly creative endeavors where new design rationale can be captured and analyzed. We claim that it is necessary to make rationale more tractable by linking it to other methods. Specifically, we have started to explore creativity-enhancing methods and tools that support the creation of sketches and storyboards—valuable early-stage design techniques for supporting and enhancing creativity in interface design—with integrated design rationale indexed by associated images.

There are numerous benefits gained through the use of sketching and storyboarding to aid the design process. When used in the early stages of design, drawings are made with tools as simple as pencil and paper. This universal, flexible medium makes design accessible to most anyone, allows for portability and encourages annotation and markup (Cook & Bailey, 2005). Sketching and storyboarding design tools like SILK (Landay & Myers, 1996), DENIM (Newman et al, 2003), and DEMAIS (Bailey, Konstan, & Carlis, 2001) seek to combine the advantages inherent to sketches and (especially) storyboards with technology's benefits of storage, retrieval, modification, sharing, and processing power. Furthermore, studies suggest that the informal, low-fidelity, and rapid-development nature of the sketching/storyboarding process allows designers to feel

comfortable proposing new ideas, focus on broad issues rather than distracting details, and quickly capture ideas without wasteful investment (Rudd, 1996).

As a starting point, we view storyboards as an ordered set of sketches, on which a design lead may impose structure or guidelines. This definition builds on that used by (Truong, 2006; Rosson & Carroll, 2002), in which storyboards describe a narrative (or scenario) of interaction often specific to a particular stage of design in which contextual aspects such as people and emotions, portrayal of time, and textual description must be included. These aspects encourage designers to consider situations, atmospheres, feelings, interactions, and context in relation to a target product's intended use as they develop new designs (van der Lelie, 2006). In so doing, storyboards can help funnel the designer's creativity to problems of greatest need—thus creating a common discussion point and opening the door to external contributions.

Computer-based sketching and storyboarding tools open the door for integrating and leveraging *design rationale* in the creative process. Design rationale is a trace of the reasoning used for design decisions during the development process. Through explicit records it can depict the artifacts, alternative options, tradeoffs, and the reasons behind choices—allowing practitioners to ground their decisions through constant analysis (MacLean et al., 1989; Carroll & Kellogg, 1989; Sutcliffe & Carroll, 1999). The rationale can exist in many different forms such as patterns (Alexander et al., 1979; Borchers, 2000) or claims (Carroll & Kellogg, 1989; Rosson & Carroll, 2002). Much research has also been done on how the design rationale for a system can be represented to capture early design deliberations. Examples include the Question, Option, and Criteria (QOC) notation (MacLean et al., 1991), the Issue Based Information Systems (IBIS) form (Conklin & Begeman, 1988), and claims maps (Wahid & McCrickard, 2006). Although design rationale systems can be very useful for communicating design issues, reflecting upon design decisions, and analyzing design outcomes”, they can suffer from limitations in capturing, using, and organizing rationale (Horner & Atwood, 2006).

We suggest that *claims* are a unit of rationale appropriate for inspiring and capturing design rationale through storyboarding. Claims have at their heart a *design feature* that captures an element of an interface that evokes a psychological positive or negative effect on a user (Carroll & Kellogg, 1989; Carroll, Singley, Rosson, 1992). Delivered in natural language, claims can address a variety of situational and interface aspects that affect the compatibility of the design and user models, such as user satisfaction and feeling of reward, colors, object layout, and strength of affordances. Their smaller and lightweight nature means they are easier to compose, expand, and share with others as opposed to the more structured and lengthier patterns—decreasing some of the burdens associated with the use of design rationale and potentially connecting well with the informal, lightweight nature of sketching and storyboarding. By making claims first-class representations in design, they can be thought of as influencing the choice and use of particular methods—supporting the identification of methodological linkages that can

demonstrate to designers that methods are not independent operators in the system of design (Harrison, Back, & Tatar, 2006). Understanding this influence and supporting ways it can be inspired and directed are the ultimate goals of this work.

Our ongoing work seeks to inspire creativity through appropriate presentation of design rationale—toward the encouragement of highly creative endeavors in which new design rationale can be captured and analyzed. We aim to accomplish this by presenting design rationale in a designer-digestible form—images that represent a system feature, with full rationale initially hidden but available later to the designer or a documenter—to encourage creative expression, but eventually enable pensive reflection regarding the design choices being made.

The benefits of linking inspiring images to rationale are twofold. First, the rationale can act as a mechanism for designers to analyze the choices they made, encouraging reflection on the system they develop. Second, the ability to see a picture or draw one's own elements is the key to increasing the amount of rationale that is captured and reused. Without having to go through large amounts of rationale and analyze them, designers can quickly acquire the gist of the artifacts by looking at pictures—decreasing some of the inhibitions we observe regarding design rationale.

Some creative decisions might be made for a variety of reasons designers have, but these decisions may be neglecting the implications on product usability. Subsequent exposure to the rationale associated with design choices allows practitioners to consider tradeoffs that might not be previously thought of. This rationale, encapsulated in the form of a claim to portray key consequences, serves as an outside opinion on the choices being made. By comparing the rationale to the designers' thoughts, one can begin to think about whether it is worthwhile to continue including the design choice.

The following scenario demonstrates how a designer—in this case a student in a design-related class—will be aided by the development of what we call the PIC-UP (Picture and Image Collocation Usability Process) tool (also see Figure 1):

Mel, a student in an introductory human-computer interaction class, is designing a handheld navigation interface for children as part of a class project. Starting with the handheld domain for her design, she used the PIC-UP system to get some initial ideas about handheld interfaces. She flipped among images of interest, grabbing promising images and probing for more information about the key claims so she could find an appropriate design that applies to the new problem. Mel sees an image of a cartoonish map, and she decides that an animated cartoon might best communicate the navigation in a way fun and engaging for children. While Mel was unaware that the original claim was based on a static cartoon as opposed to her desired animation, Mel found it made a great initial image for their storyboard. She took the screenshot and added it to a sketch she made of a teenager walking through a mall looking for a clothing store. She added a follow-up frame demonstrating how the animation would work, and another showing

how she thought a user would engage with the system. She then accessed the original image to delve into the claim data, considering how some noted downsides of using that type of interface might not work well. Most didn't seem applicable to her situation, but for those that did she considered how some of the existing solutions might apply to her situation too. Armed with the storyboard, she looked at alternative options, and she thought about why her solution was a good one--rolling her findings into a report for her class.

This scenario shows how PIC-UP will support and enhance the design process at various stages of design. Some of the key features that are illustrated in the scenario are:

- **inspiring initial ideas** using the creative ideas of others in the form of open-ended pictures. Clusters of images that represent contrasting (or complementary!) views on similar approaches will provide the designer with a sense of the problem space and how it can be approached.
- **browsing, grabbing, probing, storing, and manipulating** the images and the claims behind them, toward the development of a rich, integrative storyboard. To maximize the freedom of expression that designers appreciate in pencil-and-paper sketching environments, it is essential to support a maximal set of image manipulation functionalities.
- **incorporating part or all of an image in a storyboard** so as to allow the designer creative freedom to include relevant snips of images into a customized vision of design. Creativity often is about connecting things together that otherwise would not be connected, and about using existing things in new ways. PIC-UP will help support creativity in this way.
- **exploring design rationale** after considering creative uses for an artifact. PIC-UP will allow the designer (or someone else; perhaps a usability engineer) to consider the advantages and disadvantages of pre-existing system features captured in the claims library, examining their relevance on the current design. Additionally, as new features result from creative design, the designer can contribute new claims – attached to storyboard pictures – to the claims library. In this manner, designers can tap into the wisdom of the broader design community and make creative design contributions to the library.

Two key questions to be answered in the development of such a tool:

- **Does PIC-UP facilitate creativity?** How does the presentation of images help to inspire creativity? Do designers become more verbose? Do their drawings become richer and more diverse? Do designers deliberate more about a larger number of ideas? Do designers self-rate their own designs as more creative if given images via the PIC-UP tool? Do domain and interface experts rate their design as more creative?
- **Does PIC-UP increase design rationale contributions?** Do designers access design rationale more frequently with a lightweight image-centric portal to the rationale as compared to a standard textual portal? Do designers examine and



Figure 1: A sketch of the PIC-UP tool, used by a designer pictured in the lower left on a dual-monitor computer. On the left monitor is displayed a storyboard, perhaps chosen by a project design lead based on requirements from a client. On the right monitor is displayed a grid of pictures identified from the claims library by PIC-UP—based on a relevance calculation for the domain, the stage of action of the currently selected storyboard pane, and designer input on relevance of and interest in the currently displayed images. The designer’s task is to create a new design storyboard, addressing issues in the problem storyboard with inspiration from pictures.

The work described in this paper seeks to attain a holistic view of our efforts to center collaborative efforts around a design representation—sketches and storyboards. A design representation can drive the design process and facilitate the communication that must take place among designers (Hendry, 2004). We believe that the representation impacts the way designers think about the system. Among the many concerns, an understanding of system goals, features, task flow, and rationale can aid designers in formulating a critical understanding of a system. Simultaneously, the representation must allow for the exploration of creative solutions to design issues.

Note that designing (and learning to design) is constituted by methods brought to bear on a particular design situation. Harrison, Back, & Tatar (2006) reports on using a tidal wave of methods as a teaching method in HCI. The idea is that students do not a priori see that the process of design is designable. With regard to this work, we are (1) making rationale more tractable by linking it to other methods (storyboards are just an instance, as described in this document), (2) showing methodological linkages to demonstrate to students that methods are not independent operators in the system of design, and (3) making claims first-class representations in design to show that they can be thought of as influencing the choice and use of particular methods.

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